

[0135] The packets may be formed at the application-layer level. The packets may each include a header. The header may include: (1) position information; (2) time information as determined by a Global Positioning System receiver 52; (3) error-detection codes; (4) sequence numbers; (5) or other information.

[0136] The hub 12 also includes an alarm bus 68 (i.e., an alarm bus component). The alarm bus is configured to provide an alarm condition signal to one or more medical devices. The medical devices may be operatively coupled to the hub to receive an alarm condition signal from the alarm bus 68. The signal may be a “high” value (e.g., 5 Volts) that transitions to a “low” value (e.g., 0 Volts) to indicate that an alarm condition exists within the hub. The medical device may engage in at least one mitigation action when an alarm condition is received via the alarm condition signal. For example, the medical device may require add error-correction codes to the data sent to the hub 12. The safety processor 70 may determine when an alarm condition exists and communicates that condition to the alarm bus 68. In some embodiments, the alarm conditions may be defined by the hub 12 and/or by a medical device coupled to the hub 12. The safety processor 70 may use the local memory cache 72. The safety processor 70 may monitor the hub 12 independently of the operation of the processors 62, 82 of the SOMS 66, 86. For example, the safety processor 70 may not rely on the use of the processors 62, 82 and may operate as a watchdog to them, in some specific embodiments.

[0137] The hub 12 also includes a failsafe bus 78. The failsafe bus 76 provides a fatal, error-condition signal that indicates when a fatal, error condition has occurred within the hub 12. The signal may be a “high” value (e.g., 5 Volts) that transitions to a “low” value (e.g., 0 volts) to indicate that a fatal, error-condition exists within the hub. The medical device may be configured to operate independently of the hub when a fatal-error, condition exists as indicated by the fatal-error-condition signal. The safety processor 70 may determine when a fatal, error-condition exists and communicates that condition to the alarm bus 68. In some embodiments, the fatal-error, conditions may be defined by the hub 12 and/or by a medical device coupled to the hub 12. In some embodiments, the hubs 12, 20, and/or the medical devices 4, 6, 8, or 10 may go into a failsafe/operative mode in response to an alarm or an alert condition.

[0138] In the event when communication between a medical device (e.g., devices 4, 6, 8, 10 of FIG. 1) and the enterprise system 22 fails (See FIG. 1), the medical devices 4, 6, 8, 10 and the hub 12 may record all information within an internal memory for reporting to the enterprise system 22 when communications are restored. Additionally or alternatively, a computer may be coupled to the medical devices 4, 6, 8, 10 or the hub 12 to download the data (e.g., via a RS-232 or USB connection).

[0139] A user can input setting into the hub 12 using the buttons 48, and/or the display 54. The hub 12 may provide audible feedback through the speaker 56 or the display 54. The hub 12 may communicate sound over a LAN 38 connection to one or more of the devices 4, 6, 8, 10 for playing sound using an internal speaker.

[0140] The speaker 56 may be used to announce what the hub is doing, such as “attempting to connect to a server” or “I’m calling phone number 1-234-567-1829.” In some embodiments, the speaker 56 may be used to audibly state any error conditions, faults, and/or alarms. The messages

may be prerecorded and may be selected based upon the determined language of the patient. The messages may be transmitted to the hub 12 from the enterprise system 22 (see FIG. 1). The determined language of the patient may be based upon the location of the hub 12 (e.g., determined via the GPS signal), from the patient’s records or from any other way known to one of ordinary skill in the relevant art. The prerecorded voice may be a voice of a familiar provider to the patient.

[0141] In addition to the audio component of the messages, the messages may also include a prerecorded video that is displayed on the display 54. The audio and video may be synchronized with each other.

[0142] The speaker 56 and the display 54 may be used to provide training videos to the user regarding the operation or configuration of the hub 12 and/or the medical devices 4, 6, 8, 10 (see FIG. 1). Additionally, in some embodiments, speaker 56 and the display 54 may be used to provide health notes and/or CPR training.

[0143] FIGS. 3A-3B show a flow chart diagram 88 illustrating a method for communicating data in accordance with an embodiment of the present disclosure.

[0144] Act 90 associates a first hub with one of an ID, a patient, a medical device, and a treatment. Act 92 receives data from the medical device by the first hub (which may be stored in a local cache). Act 94 encrypts the data. Act 96 packages the data from the medical device into at least one packet. A packet of the at least one packet includes a header.

[0145] Act 98 determines a present time and date. Act 100 adds the determined present time and date to the header of the packet. Act 102 adds a sequence number to the header of the packet. Act 104 determines an error-detection code. Act 106 adds the error-detection code to the header of the packet. Act 108 communicates the at least one packet over a network through at least one communications channel. Act 125 communicates an alarm from the first hub to a medical device when an alarm condition occurs within the first hub, if necessary. For example, if the alarm is a fatal alarm. The alarm may be communicated using the alarm bus 68 of FIG. 2, in some embodiments.

[0146] Act 110 receives the at least one packet over the network operatively through the at least one communications channel by a second hub. Act 112 determines whether the data within the packet is error free by examining the error-detection code within the header. Act 114 determines whether the present time and date within the header of the packet meets a first predetermined criterion. Act 116 reassembles the data using the sequence number of the header of the packet.

[0147] Act 118 decrypts the Data. Act 120 determines whether at least one of the packet and the data satisfies a second predetermined criterion. Act 122 communicates an acknowledgment character corresponding to at least one of the packet and the data to the first hub if the second predetermined criterion is satisfied. The second predetermined criterion may be, for example, that the data has been logged into a database. Act 124 routes the data from the hub to at least one enterprise server. One or both of the hubs may monitor the communications channel(s), e.g., using heart-beat signals.

[0148] Various alternatives and modifications can be devised by those skilled in the art without departing from the disclosure. Accordingly, the present disclosure is intended to embrace all such alternatives, modifications and variances.